Claims

What is claimed is:

1. A method of calibrating a DC motor, comprising the steps of:

    a) choosing at least one PWM duty cycle value of interest;

    b) applying a startup PWM duty cycle of sufficient magnitude to insure motion of said motor;

5   c) performing a first test wherein the first chosen duty cycle is applied in at least two periods, each of said periods being of opposite polarity from the period preceding it, and the current in the motor is measured during each of said periods;

    d) performing a test for each additional chosen PWM duty cycle value of interest, wherein each of said PWM duty cycles is applied in at least two periods, each of said periods being of opposite polarity from the period preceding it, and the current in the motor is measured during each of said periods; and

    e) calculating the apparent resistance of the motor.

2. The method of calibrating a DC motor of claim 1, wherein at least two PWM values of interest are chosen.

3. The method of calibrating a DC motor of claim 1 further comprising the steps of:

    a) applying a PWM sufficient to move said motor prior to each operational movement of said motor;

5   b) taking a supplemental measurement of the current in said motor; and

    c) modifying said calculated apparent resistance.

4. The method of calibrating a DC motor of claim 1, wherein the test for each chosen PWM duty cycle values of interest comprises at least four periods.

5. The method of calibrating a DC motor of claim 1 wherein said periods are of equal time.

6. The method of calibrating a DC motor of claim 5 wherein said periods are approximately equal to two milliseconds.

7. The method of calibrating a DC motor of claim 1 further comprising the step of repeating each of said tests.

8. The method of calibrating a DC motor of claim 7 further comprising the step of applying a startup PWM duty cycle of sufficient magnitude to insure motion of said motor prior to repeating said tests.

9. The method of calibrating a DC motor of claim 1 wherein said tests are generally conducted in order from low duty cycles to high duty cycles.

10. The method of calibrating a DC motor of claim 1 wherein each of said periods is characterized by a chopping period, said chopping period being between 10 and 100 microseconds in length.

11. The method of calibrating a DC motor of claim 1 further comprising the steps of:

     a) repeating each of said tests in the same order, recording an independent array of results; and

5   b) discarding for each value of PWM all but the array exhibiting the lowest average current value, prior to calculating the apparent resistance of the motor.

12. The method of calibrating a DC motor of claim 1 further comprising the step of applying a voltage to move said motor to a known stop-point.

13. A method of calibrating a DC motor, comprising the steps of:

     a) choosing at least one direct current voltage of interest;

     b) applying a startup direct current voltage of sufficient magnitude to insure motion of said motor;

5   c) performing a first test wherein the first chosen voltage is applied in at least two periods, each of said periods being of opposite polarity from the period preceding it, and the current in the motor is measured during each of said periods;

     d) performing an additional test for each chosen voltage of interest, 10 wherein each of said voltages is applied in at least two periods, each of said periods being of opposite polarity from the period preceding it, and the current in the motor is measured during each of said periods; and

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e) calculating the apparent resistance of the motor.

14. The method of calibrating a DC motor of claim 13 wherein at least two voltages of interest are chosen.

15. The method of calibrating a DC motor of claim 2, wherein said chosen PWM values include at least one below 50 percent and one above 50 percent.

16. A method of calibrating a DC motor, comprising the steps of:

a) applying a voltage sufficient to move said motor, while not inducing a large velocity;

b) measuring the current in said motor; and

5 c) calculating the apparent resistance of said motor.

17. The method of calibrating a DC motor of claim 16 wherein said voltage is applied with both positive and negative polarity in succession.

18. The method of calibrating a DC motor of claim 17 wherein said voltage is applied in PWM fashion.

19. The method of calibrating a DC motor of claim 17 wherein said voltage is applied in DC fashion.